IDAHO FOREST INSECT and DISEASE REPORT

IDAHO DEPARTMENT OF LANDS

GYPSY MOTH ERADICATION PROGRAM

in

IDAHO

1989

Sandpoint and Coeur d'Alene

Bonner and Kootenai Counties

by

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STATE OF IDAHO

DEPARTMENT OF LANDS

COEUR D'ALENE

Report No. 90-4
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ABSTRACT

The Idaho Department of Lands with cooperation from the USDA Forest Service, Region 1, and the USDA-Animal and Plant Health Inspection Service implemented plans to eradicate the gypsy moth, Lymantria dispar L. from two infestation sites in north Idaho. Approximately 110 acres in Coeur d'Alene and 270 acres in Sandpoint were treated with Bacillus thuringiensis (Bt), a biological insecticide. Each site received three aerial applications of Bt at 7- to 10-day intervals.

A mass trapping program was implemented as a follow-up to the insecticide treatment using a trap density of 9 per acre. Approximately 150 acres in Coeur d'Alene and 675 acres in Sandpoint were trapped. A total of 28 moths were caught in Coeur d'Alene and 23 in Sandpoint. This represents a reduction from last year's catches of 67 percent and 93 percent, respectively. Two small infestations were delineated in each city.

An intensive egg mass survey was conducted covering 4 acres in Coeur d'Alene and 6 acres in Sandpoint. Two egg masses were found in Coeur d'Alene at one site. In Sandpoint five egg masses were found, four of which were at one site.

INTRODUCTION

The gypsy moth was first detected in Idaho in 1986 when one male moth was caught in a pheromone-baited survey trap at Sandpoint. In 1987, 22 males were caught at Sandpoint, 11 at Coeur d'Alene, and one each at Lewiston and Cascade.

An egg mass survey was performed in the Spring of 1988 with 1,440 properties being searched in Coeur d'Alene and 1,170 in Sandpoint. Forty-four egg masses were found in Sandpoint and three in Coeur d'Alene. A total of 4 properties in Coeur d'Alene and 21 in Sandpoint were found to have evidence of various gypsy moth lifestages.

In an effort to reduce the population as much as possible, a ground spray program was initiated in May of 1988. Orthene, an organic phosphorus insecticide, was used on ornamental trees, and the bacterium Bacillus thuringiensis, a biological insecticide, was applied to fruit trees. A total of 23 trees in Coeur d'Alene and 68 trees in Sandpoint were treated. Each tree was sprayed three times.

Summer pheromone trap and fall egg mass surveys revealed that the gypsy moth was still present in both towns. In Coeur d'Alene 87 male moths were caught and 2 egg masses located. In Sandpoint 334 male moths were caught and 32 egg masses located. A direct comparison of pheromone trap catches between 1987 and 1988 cannot be made as a grid system of trap placement covering all of the infested area was used for the first time in 1988.

In a fall evaluation of the gypsy moth situation, it was the consensus of the Idaho Department of Lands, the USDA Forest Service, the USDA-Animal and Plant Health Inspection Service, and the Idaho Department of Agriculture that the gypsy moth was established in Sandpoint and Coeur d'Alene and that an eradication effort should be initiated.

An environment assessment (Rivas 1989) was prepared covering several options; public meetings were held; news releases and general information was provided to newspapers and radio and television stations of the area; and general information covering the gypsy moth and announcements for the public meetings were hand-delivered or sent to all residents within the proposed treatment areas.

After reviewing the situation and receiving public comment, the Idaho Board of Land Commissioners on May 1, 1989, authorized implementation of plans to eradicate the gypsy moth from Idaho.

OBJECTIVES

1. To eradicate the gypsy moth from Idaho using the following procedures:

   a. To implement three aerial applications of the biological insecticide Bacillus thuringiensis (Bt) to infestation sites in Coeur d'Alene and Sandpoint. Bt works best on first through third instar larvae. Three applications of Bt are necessary due to the prolonged hatching period of gypsy moth and the short active life of the pesticide.

   b. To implement a mass trapping program as a follow-up to the insecticide treatment. Mass trapping is employed to further reduce and to locate any residual population not affected by the insecticide.

2. To conduct an intensive egg mass survey in areas where multiple moth catches occur. Results of egg mass surveys are used as gauges to measure the effectiveness of control programs and also as aids in planning future action.

PUBLIC INFORMATION

The information effort was to inform and educate the public about the pest, the need to control it, and the pesticide to be used. Special care was taken in selecting the pesticide due to concerns for the environmental and for human health when using an insecticide in an urban area. A total of four public meetings were held in Coeur-d'Alene and Sandpoint. Overall consensus was favorable for the spray project.

Numerous articles appeared in local newspapers throughout the time of the entire program. The content of the articles ranged from general information about the gypsy moth to announcing spray dates and times. Presentations were also given to the County Commissioners for both Kootenai and Bonner counties.

Fliers announcing the first aerial application of insecticide were distributed to residents within the project areas the evening prior to the first treatment (Appendix B and C). Local Boy Scout troops were contracted to distribute them.

A toxicology profile for the Bt pesticide used was sent with a cover letter explaining the project to all physicians in both Coeur d'Alene and Sandpoint so that they could be familiar with the product (Appendix D).

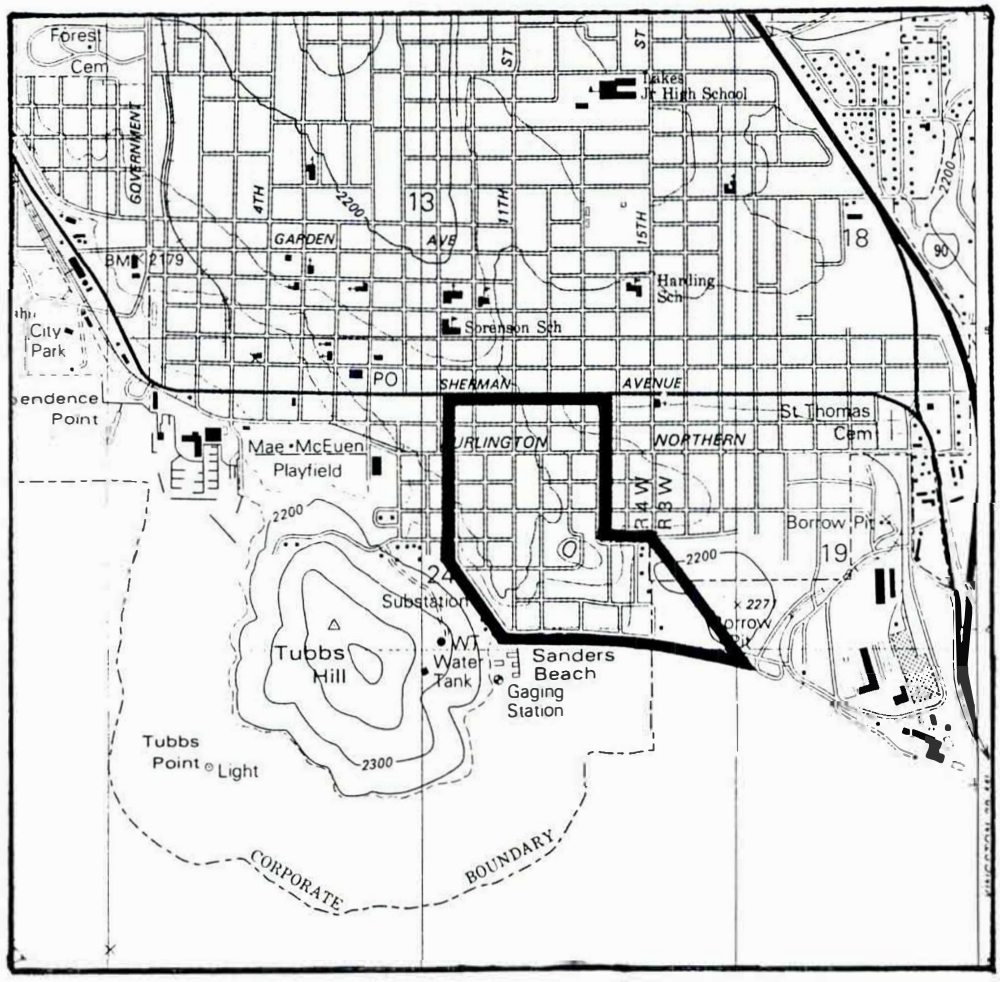
PROGRAM AREA

The aerially-applied pesticide treatment area for Coeur d'Alene was 110 acres (Figure 1) and for Sandpoint 270 acres (Figure 3). The treatment areas for both cities were determined from the previous year's moth catches and egg mass locations. A perimeter buffer area of one block was added to assure complete coverage.

The mass trapping area encompassed and extended beyond the spray area for both Coeur d'Alene (Figure 2) and Sandpoint (Figure 4). Kootenai, a suburb of Sandpoint and several other sites (Figures 2 & 4), were also mass trapped because of single moth catches in 1988. A total of 150 acres in Coeur d'Alene and 675 acres in Sandpoint were mass trapped.

Figure 1.

Coeur d'Alene spray area



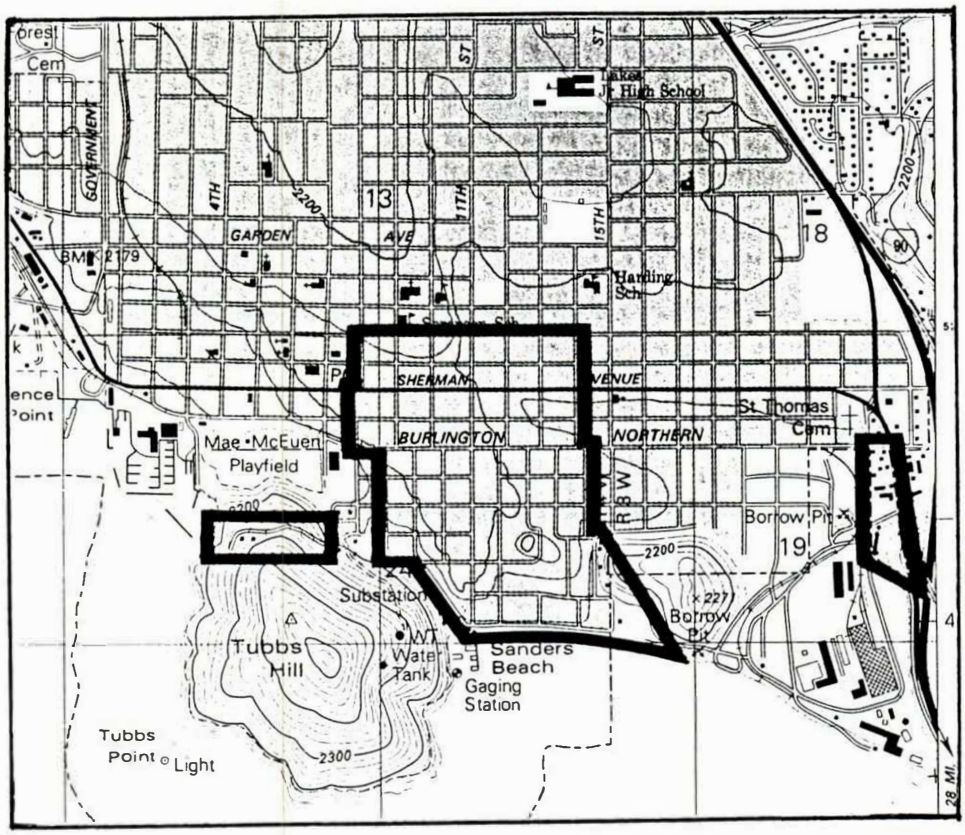


Figure 2.

Coeur d'Alene mass trapping areas

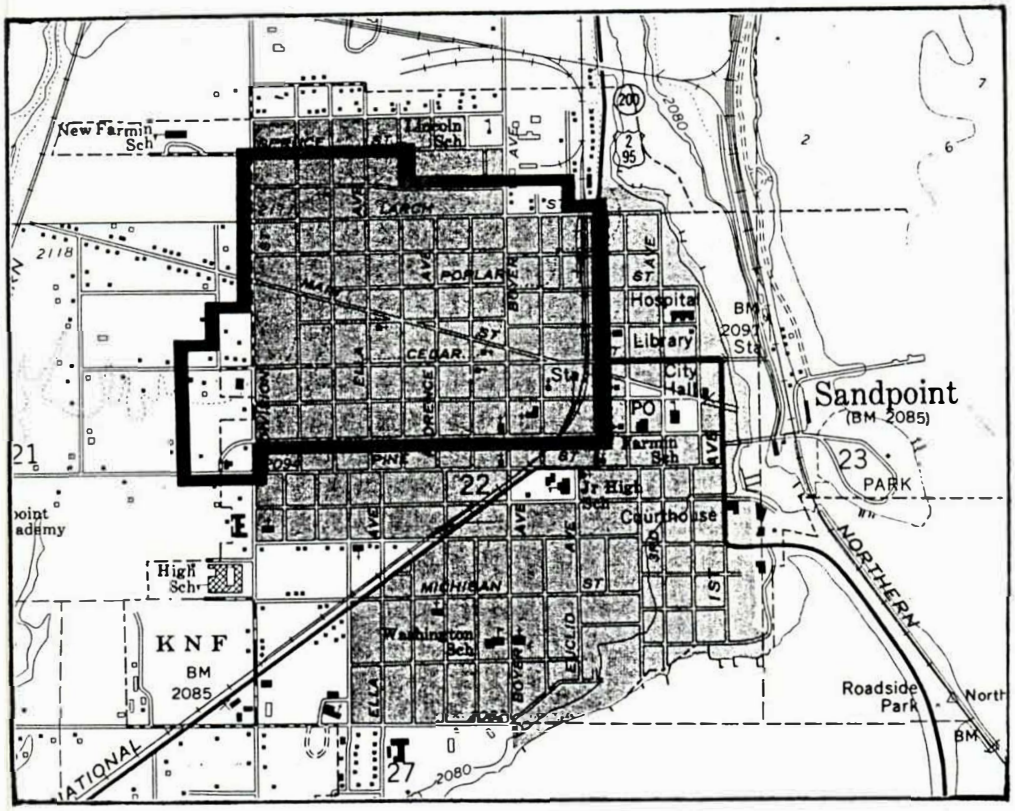
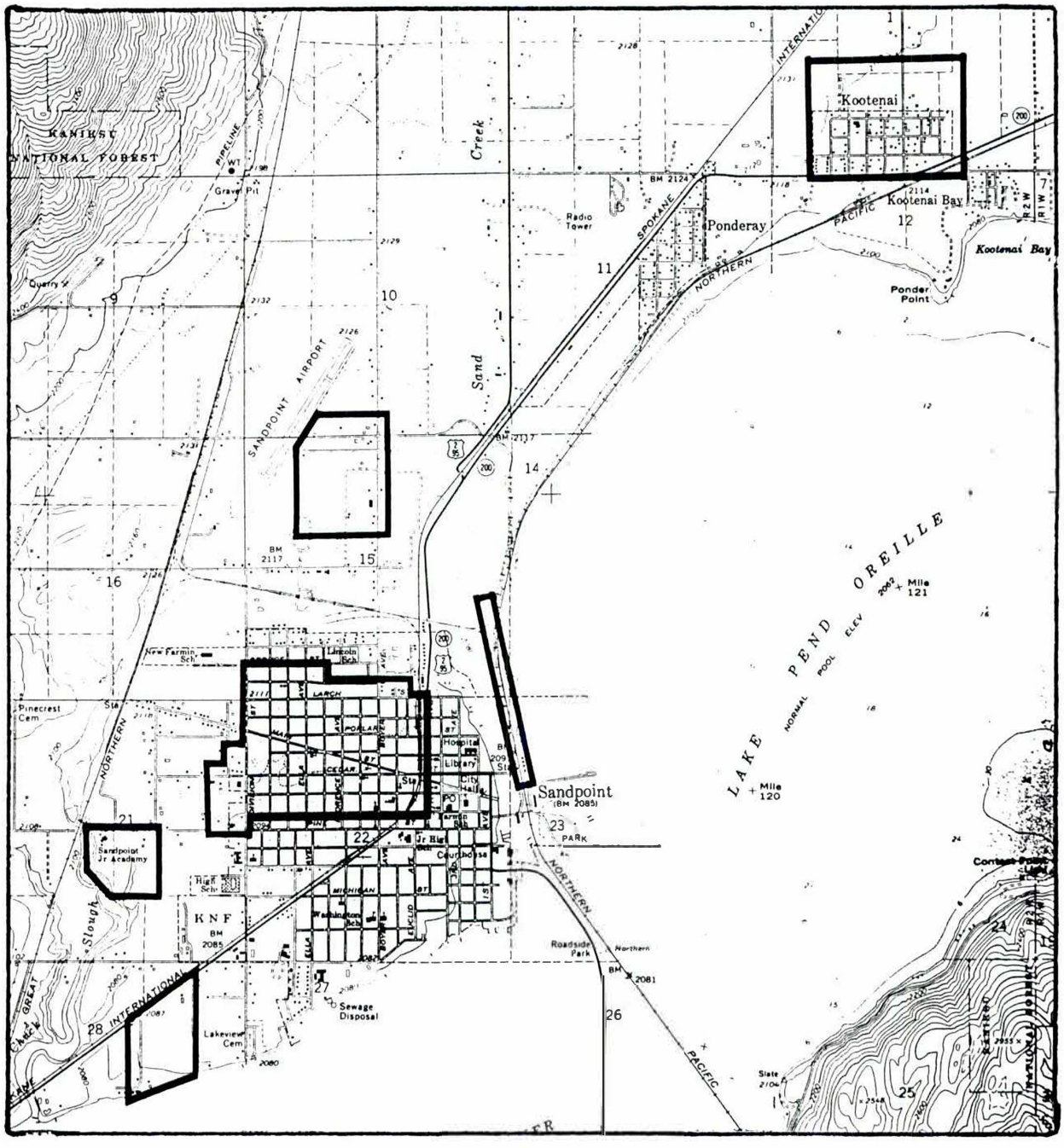


Figure 3.

Sandpoint spray area.

Figure 4. Sandpoint mass trapping areas.



INSECTICIDE

Description

Dipel 8L, a biological pesticide produced by Abbott Laboratories was the pesticide of choice due to its narrow range of target insects and lack of general impact on the environment. It is an emulsifiable suspension of the bacterium Bacillus thuringiensis (Bt) insecticide designed for forestry applications. The Bt used in Dipel is a naturally occurring bacterium that is common in the environment. It is selective in that it is a natural pathogen affecting only the insects in the Order Lepidoptera (moths and butterflies). It has no known adverse effects on other arthropods or life forms such as man, pets, fish, or birds. Dipel 8L contains 64 BIUs of Bt per gallon. This formulation disperses readily into water and forms a free-flowing spray suitable for low volume aerial application. Dipel 8L is not classified as a hazardous material. The mode of action of Bt is as a stomach poison. It must be ingested by the larvae to be effective. Proteinaceous crystals formed during sporulation of the bacterium disrupt the stomach lining of larvae and causes them to cease feeding.

Mixing and Storage

All mixing took place at the MICA Fire Protection District office in Coeur d'Alene and at the Idaho Department of Lands compound in Sandpoint. Both locations had asphalt pavement which was a requirement of the Idaho Department of Environment for mixing sites. A gel-type absorbent was kept at the site in the event of a major spill.

The insecticide was mixed in the ratio of one gallon Dipel to two gallons water. Application rate was three quarts (96 oz.) mixture per acre which gave a final delivery of 16 BIUs Bt per acre. Plyac, a latex-based sticker/surfactant was added at the rate of 2 percent by volume of water. The amounts of each component for both spray areas are shown in Table 1. Mixing was done the evening before each spray. There was no concern about the possibility of the Dipel coming out of suspension because mixtures of Dipel will remain stable for periods of up to 144 hours under normal field conditions.

Table I. Amounts of each ingredient for both spray areas (gallons).

	Sandpoint: 270 acres	Coeur d'Alene: 110 acres
Water @ 2 qts/a	135	55
Plyac @2% by volume	2.7	1.1
Dipel 8L @ 1 qt/a	67.5	27.5
Total	205.5	83.6

The bulk Dipel was stored at the MICA Fire Protection District office in Coeur d'Alene. The insecticide was delivered in seven 55 gallon drums and placed under an outdoor shed. Several sheets of plywood were placed around the drums to protect them from direct sunlight. There was no concern about the Dipel freezing because temperatures were well above this at that time of year.

MONITORING EGG MASSES

In order to apply the insecticide at the stage when the larvae were most vulnerable, egg masses were monitored in the field to determine when egg hatch and larvae dispersal and feeding began. Our plan was to begin the treatment soon after the eggs were hatched and larvae dispersed. Twenty-four egg masses were monitored in Sandpoint. The egg masses found in Coeur d' Alene in 1988 had been removed; therefore, no observations were made there. Observations began April 24 and continued until treatment began. The egg masses were collected and destroyed when hatching began.

A gypsy moth phenology model, GMPHEN[1] was also used to predict timing of egg hatch. GMPHEN is a computer model that uses daily temperatures and published data to predict the timing of gypsy moth development. GMPHEN had been used in 1988 and was accurate to within one day in predicting commencement of egg hatch.

Six egg masses were collected and brought to the Insect and Disease Laboratory in Coeur d'Alene. Larvae from three of the egg masses were used for a spray bioassay. They were reared on foliage from

[1]GMPHEN: A gypsy moth phenology model; by Katharine A. Sheehan. USDA Forest Service, Portland, OR. Manuscript in review.

the two spray zones, and observations and mortality rates were recorded. The other three egg masses were used to determine percent of egg hatch.

SPRAY EQUIPMENT

The spray aircraft was a Hiller-Soloy 12E single-rotor, turbine-engine helicopter. The spray tank was fiberglass, with 140-gallon capacity, and externally mounted. The spray boom was 33 feet long and had three Beacomist Model 360A electronic rotary atomizer nozzles mounted on each side. The three nozzles on each side of the boom were spaced 21 inches apart with the inside nozzle 4.5 feet from the center of the aircraft. The contractor also furnished a 200-gallon fiberglass mix tank mounted on a one-ton flatbed truck. The mix tank was fitted with a recirculation pump which provided adequate agitation for mixing.

In order to gain authorization for low-level spray flights over the cities all aspects of FAA Agricultural Aircraft Operations Regulations 137.51 and 137.53 had to be complied with. Signs were posted on all major streets at the entrance to the spray areas on the day of each operation. Written approval was obtained from the mayors and city councils of Coeur d'Alene and Sandpoint. Notice of operation was given 48 hours in advance by radio, newspaper, and fliers. Flight plans were prepared and flight hazards and emergency landing sites were identified for each city. Pilot experience and aircraft maintinance requirements were also met.

CALIBRATION AND CHARACTERIZATION

Calibration was performed at the MICA office heliport in Coeur d'Alene. Water was used since its specific gravity was essentially the same as that of the final mixture (.97). System malfunctions and leaks were detected and corrected at this time.

The six Beacomist nozzles produced a 50-gallon delivery rate in 6.6 minutes at a boom pressure of 27 psi. This coincided with the predetermined figure of 10 acres per minute at 50 mph with an effective swath width of 100 feet. This gave the desired delivery rate of 96 ounces per acre.

Characterization was performed on the median strip at the Coeur d'Alene airport. Five cardlines, each with 20 cards at 10-foot intervals, were used. After the five trials, it was determined that drop density and volume median diameter (VMD) were within predetermined specifications of not less than 20 drops/cm^2 and 100-150 VMD, respectively. The predetermined altitude of 50 feet was increased to 60 feet in order to obtain a swath width of 100 feet.

SPRAY DEPOSIT ASSESSMENT

Spray deposit was assessed using Spraying Systems Company Teejet® water-sensitive cards. Five cardlines, for each spray, were placed within the treatment areas in Coeur d'Alene and Sandpoint. Each cardline consisted of 10 cards spaced 20 feet apart. The cards, inserted in plastic holders, were placed in the middle of streets or, if no canopy was present, on sidewalks. The cards were picked up immediately after the spray had settled in order to prevent damage to them from automobiles.

The cards were later analyzed for drop density and VMD. Drop density was determined using a plastic template. VMD was determined using the D-max method (Dumbauld and Rafferty 1977).

Spray behavior and deposit was modeled using the FSCBG model developed by the USDA Forest Service (Bjorklund and others 1988). Model runs were completed for both Coeur d'Alene and Sandpoint.

FLIGHT PATH FOLLOWING

A Pathlink™ Recorder Model PR2000 supplied by Pathcor Div. of Technology Projects Ltd., Tempe, Arizona, was mounted on board the spray aircraft. The Pathlink system provides a method for determining and documenting location based on latitude and longitude, and event status of any vehicle operated within a geographical area covered by an adequate LORAN-C signal. We attempted to record flight path and spray boom on\off information.

METEOROLOGICAL CONDITIONS

Spot weather forecasts were provided by the National Weather Service in Missoula, Montana. Weather data was collected at the spray site the morning before each treatment and submitted to the weather service via a Data General communications computer located at the MICA Fire Protection District office in Coeur d'Alene. The forecast was received by late afternoon the same day. Weather information was also obtained from the flight weather service at Spokane airport. Decisions on whether or not to commence treatment were based on information from these two sources.

There were eight criteria for terminating the spray operation (Rivas 1989). However because of the time of year and time of day when the operation was scheduled, we were only concerned with two of them, wind speed of greater than 8 mph and threat rain within six hours of application.

MARKING SPRAY BOUNDARIES AND SWATHS

Forty-inch yellow helium balloons were used to mark the spray area boundaries and swaths. Each balloon was attached to a 100-foot length of braided fishing line. One balloon was placed at each corner of the treatment areas to mark the boundaries. To mark the swaths, balloons were placed at 400-foot intervals on one side of the spray zone. The pilot was able to estimate each 100-foot swath width between the 400-foot markers.

Caution signs were placed at major intersections leading into the treatment areas. The signs were 18-inch by 28-inch orange construction paper with black lettering. These were attached to fold-out type highway markers provided by the Idaho Department of Transportation.

MASS TRAPPING

Mass trapping has been used in conjunction with aerial insecticide applications to eradicate isolated populations of gypsy moth. In addition to serving as a control method, mass trapping is also a very effective means of pinpointing any residual population not affected by the insecticide application.

A trap density of 9 per acre was used for residential areas. Trap placement location was determined with the aid of aerial photographs. The acreage of each city block was calculated, and the appropriate number of traps assigned to them. Trap locations for each block were specified by making marks on the photograph with a felt pen. The marks, representing trap locations, were spaced as evenly as possible. This procedure greatly aided trap personnel in placing traps.

A trap density of 6 per acre was used in wooded areas. Locations to be trapped were indicated on maps, and personnel used 85-foot strings to set up a grid within these areas.

Information for each trap was recorded on individual data cards (Appendix E). Information recorded included city-site, trap number, address, location diagram, date placed, service record, and date removed. The location diagram was drawn so that someone other than the trapper could find the trap if need be.

In addition to placing traps, personnel were responsible for promoting good public relations. This included informing property owners about gypsy moth and the mass trapping program. Personnel were instructed to spend considerable time in this effort. Property owners were asked for permission before traps were placed.

If no one was at home, a letter (Appendix F) was left instructing the owner to call the Department of Lands if they did not want traps on their property.

It was predicted that some traps could not be placed due to property owners refusal to give permission. Trap personnel were instructed to assign a trap card and number for these locations. It was decided that, if a very large gap in trap placement was created because of refusals, personnel would return at a later date and try to obtain permission.

The trapping program began June 12 with a training session in Sandpoint. Trap placement began June 13 and ended July 17 when all traps were in place. All traps were checked twice weekly from July 22 until September 8. When a moth was caught, the trap was removed, replaced with a new one, and brought to the lab for positive identification of the moth.

EGG MASS SURVEY

An intensive egg mass survey was conducted following the mass trapping program. An intensive egg mass survey is used for small populations when a walk-through survey would result in no egg masses being detected. Selection of areas to be surveyed were based on having greater than four positive catches within one city block.

BUDGET

This project was funded by the Idaho Department of Lands with cooperative cost share suppression funds being provided by the USDA Forest Service, Region 1, and the USDA-Animal and Plant Health Inspection Service. Cost per acre for the spray project was $123.87/acre and $67.78/acre for mass trapping. Table II shows a budget summary.

RESULTS

Egg Mass Monitoring

Hatching of egg masses took place over a nine-day period (Table III). The first observed hatch was on April 28 when four egg masses began to hatch. The last egg mass began to hatch on May 5. The greatest number of egg masses that began to hatch on a single day was nine and occurred on May 3. GMPHEN predicted that egg hatching would commence on May 2.

Table II. Budget summary.

ITEM	COST
Spray:	
Aircraft	$27,690.00
Plyac	525.00
Personnel	10,842.47
Travel and Per Diem	1,333.41
Supplies	1,460.45
Vehicles	881.41
Miscellaneous	1,245.12
Public Meetings	915.43
Environmental Assessment	2,178.89
Sub-Total	47,072.18
Trapping:	
Personnel	51,154.27
Travel and Per Diem	2,286.41
Supplies	1,120.88
Sub-Total	54,561.56
Egg Mass Survey:	
Personnel	2,129.23
Total	103,762.97

Table III. Hatching dates of egg masses.

Date	4/28	5/1	5/2	5/3	5/4	5/5
Number hatching	4	3	3	9	1	1

All egg masses were removed and destroyed when the first hatching began except for two of them. These were left to determine how long the larvae remain on the egg mass before they disperse. Both

of these egg masses began to hatch on May 3. The larvae remained clustered on the egg mass until May 7, a period of four days. Of the 24 egg masses monitored, all but three had hatching take place.

Of the six egg masses brought to the laboratory, all had egg hatching occur. When hatching had apparently ceased, three of the egg masses were placed in the freezer overnight. This facilitated counting the larvae to determine the percent of egg hatch. Percent of egg hatch ranged from 92 percent to 96 percent (Table IV). The other three egg masses, the larvae of which were used in the spray bioassay, appeared to have hatching rates similar to those described above.

Table IV. Summary of percent egg hatch data.

Egg mass	Total eggs	Number hatched	Percent hatched
1	643	598	93
2	436	403	92
3	505	485	96

Spray Bioassay

Treated foliage from the second and third spray was used for the bioassay. Of the 52 larvae fed foliage from Sandpoint, there were no survivors. Of the 38 larvae fed foliage from Coeur d'Alene, there were four that survived to the adult stage. Two of these had developmental rates about three weeks longer than larvae reared on untreated foliage.

Spray Operation

Based on timing of egg hatch, the first spray for Coeur d'Alene was scheduled for May 10 and for Sandpoint May 11. Due to rain and high winds, the first spray was delayed for two days. The second spray for Coeur d'Alene and Sandpoint was completed on May 21 and May 22, respectively. The third spray for Coeur d'Alene was completed on May 30 and for Sandpoint on June 2.

Spray Deposit Assessment

Results are provided in Table V. Droplet density ranged from 3.9 to 29.1 and VMD from 109.7 to 132.6 for Coeur d'Alene. For Sandpoint, droplet density ranged from 19.8 to 52.3 and VMD from 104.8 to 116.9. The results for Coeur d' Alene are based on only four of the cardlines. The fifth cardline was located along the south border of the area next to the lake and, as predicted by the FSCBG spray behavior model (Bjorklund and others 1988), no spray was deposited there due to the prevailing south winds.

Table V. Summary of spray deposit data.

Coeur d' Alene: Spray	Drop density #/cm	VMD
1	10.85	109.67
2	3.94	132.58
3	29.10	124.46
Sandpoint:		
1	19.76	116.89
2	32.24	104.77
3	52.25	109.10

Flight Path Monitoring

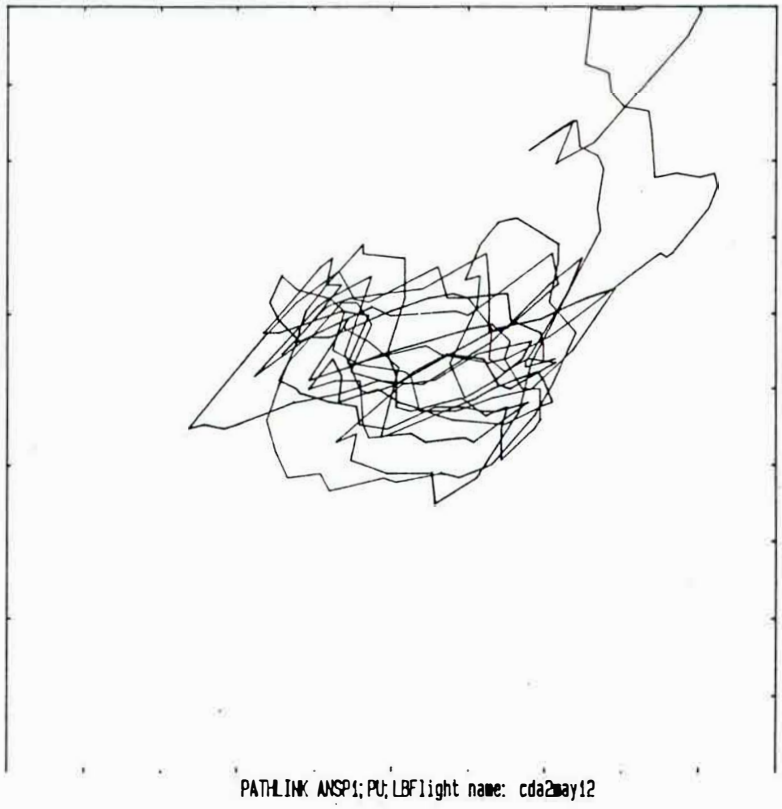
The flight path following system did not function as anticipated. Apparently the Hiller-Soloy 12E helicopter generated excessive static electricity that caused the figures produced by the system to show only jagged representations of the flight lines (Figure 5) that were not intelligible. Many efforts were tried using different Loran transmitters, improved grounding of the electronics units and different antennal positions, none of which improved the results.

Mass Trapping

A total of 1,343 traps were placed in Coeur d' Alene covering approximately 150 acres. There were no refusals from property owners to place the traps. A total of 5,907 traps were placed in Sandpoint covering approximately 655 acres. Due to property owner refusals, 117 traps were not placed. However, no large gaps were created in trap placement because of this.

Figure 5.

Unsuccessful plotting of spray block flight lines for Coeur d'Alene



A total of 28 male moths were caught within the mass trapping area in Coeur d'Alene. Two small pockets were delineated (Figure 6). One of the pockets had 18 catches and the other had four (Figure 7). The remaining six catches were scattered throughout the trapping area. Two of these catches were outside the spray area. Four other moths were caught in detection traps (Figure 6 and Appendix G).

In Sandpoint 23 male moths were caught within the mass trapping area. Two pockets were delineated (Figure 8). One of the pockets had 10 catches and the other had eight (Figure 9). The pocket with eight catches was located one block outside the spray area. The remaining five catches were isolated single catches. Four of these were within the spray area and the other was outside. Six other moths were caught in detection traps (Appendix G).

Egg Mass Survey

Based on positive pheromone trap catches, two locations in Coeur d' Alene and two in Sandpoint were surveyed. In Coeur d' Alene

two egg masses were found on a single property (Figure 7). In Sandpoint five egg masses were found (Figure 9). Four of these were found in one area; three on a single tree, while the fourth was detected on an adjacent property.

Figure 6. Mass trapping areas showing locations of moth catches and positive detection trap sites in Coeur d'Alene.

● = eradication moth catch sites, 9 traps per acre

■ = positive detection survey sites, 36 traps per square mile, all single moth catches

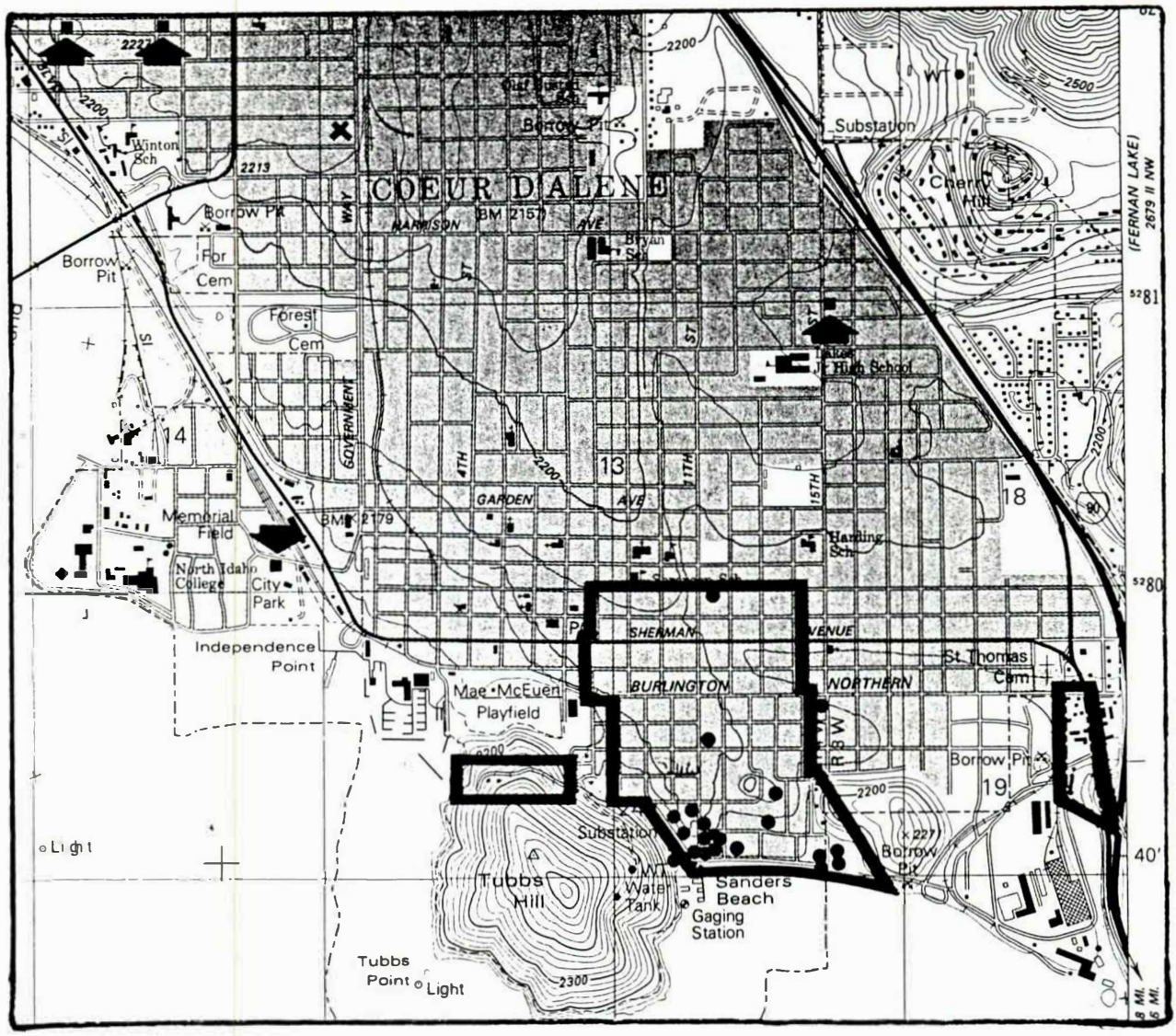


Figure 7. Detail of area of concentrated moth catches and egg masses found in Coeur d'Alene.

●^{n} = site and number of moths caught

▲^{n} = site and number of egg masses found

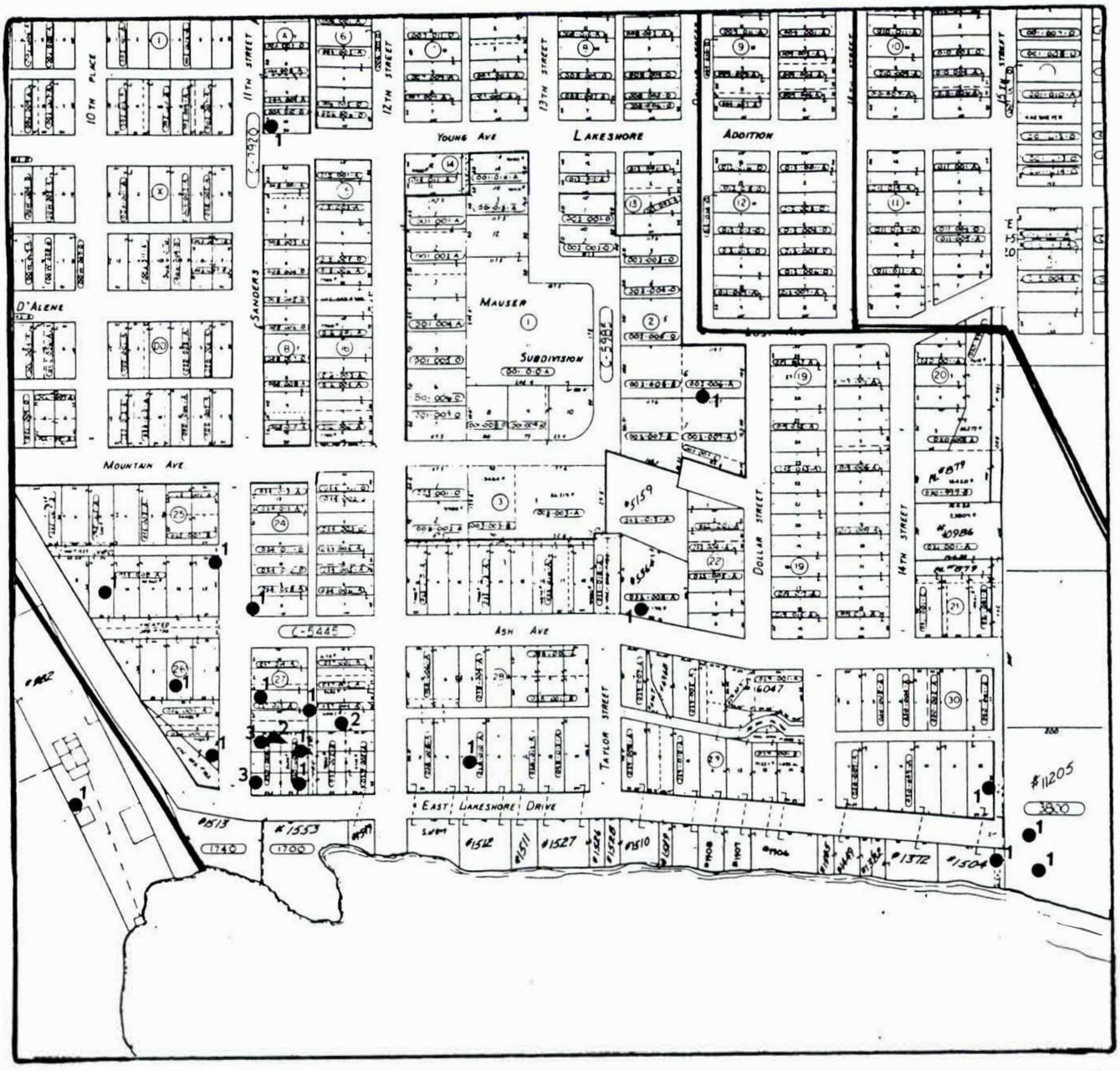


Figure 8. Mass trapping areas showing locations of moth catches and positive detection trap sites in Sandpoint.

● = eradication moth catch sites, 9 traps per acre

■ = detection survey moth catches, 36 traps per square mile. Extra traps were placed at time of 1st catch.

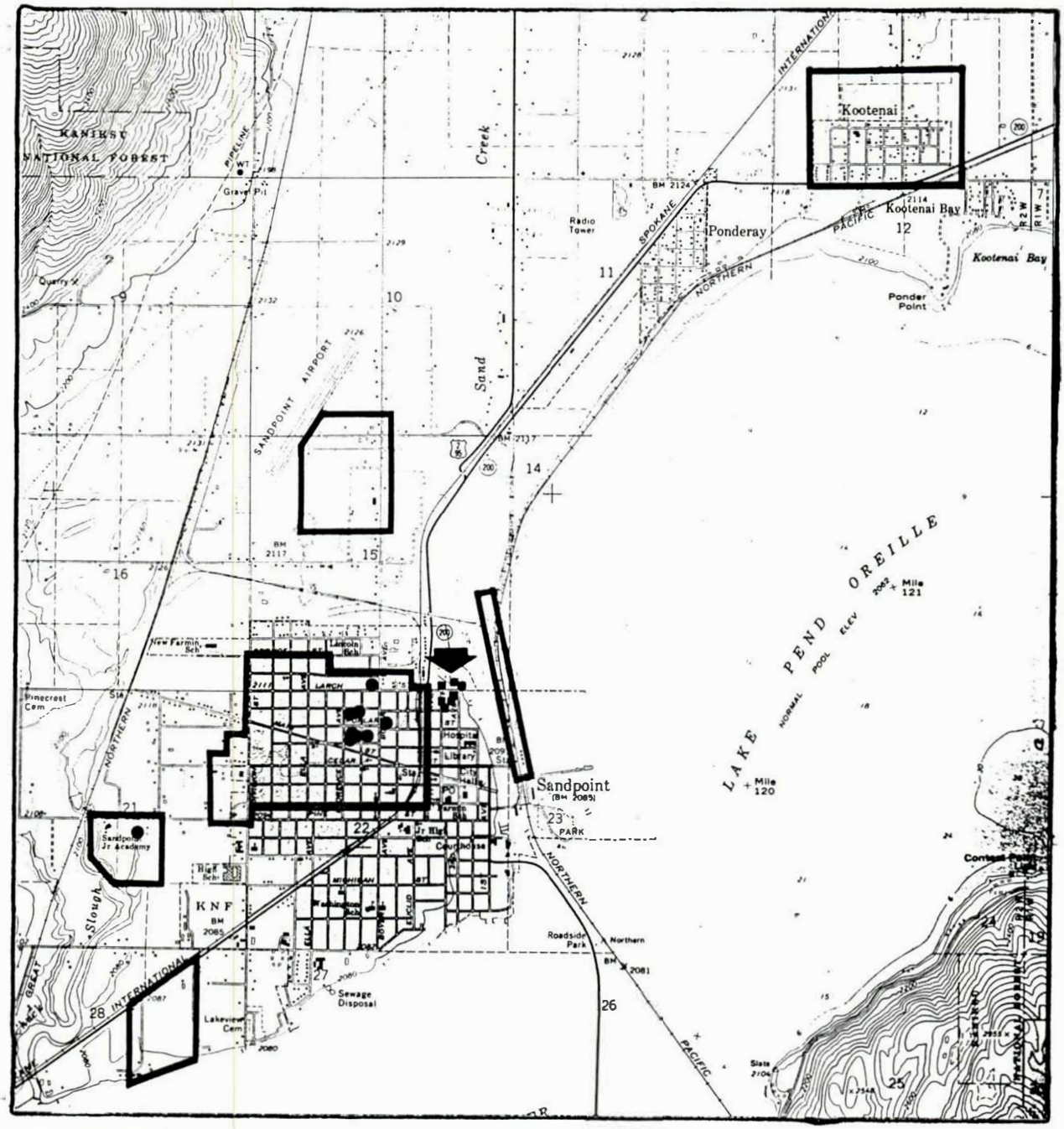
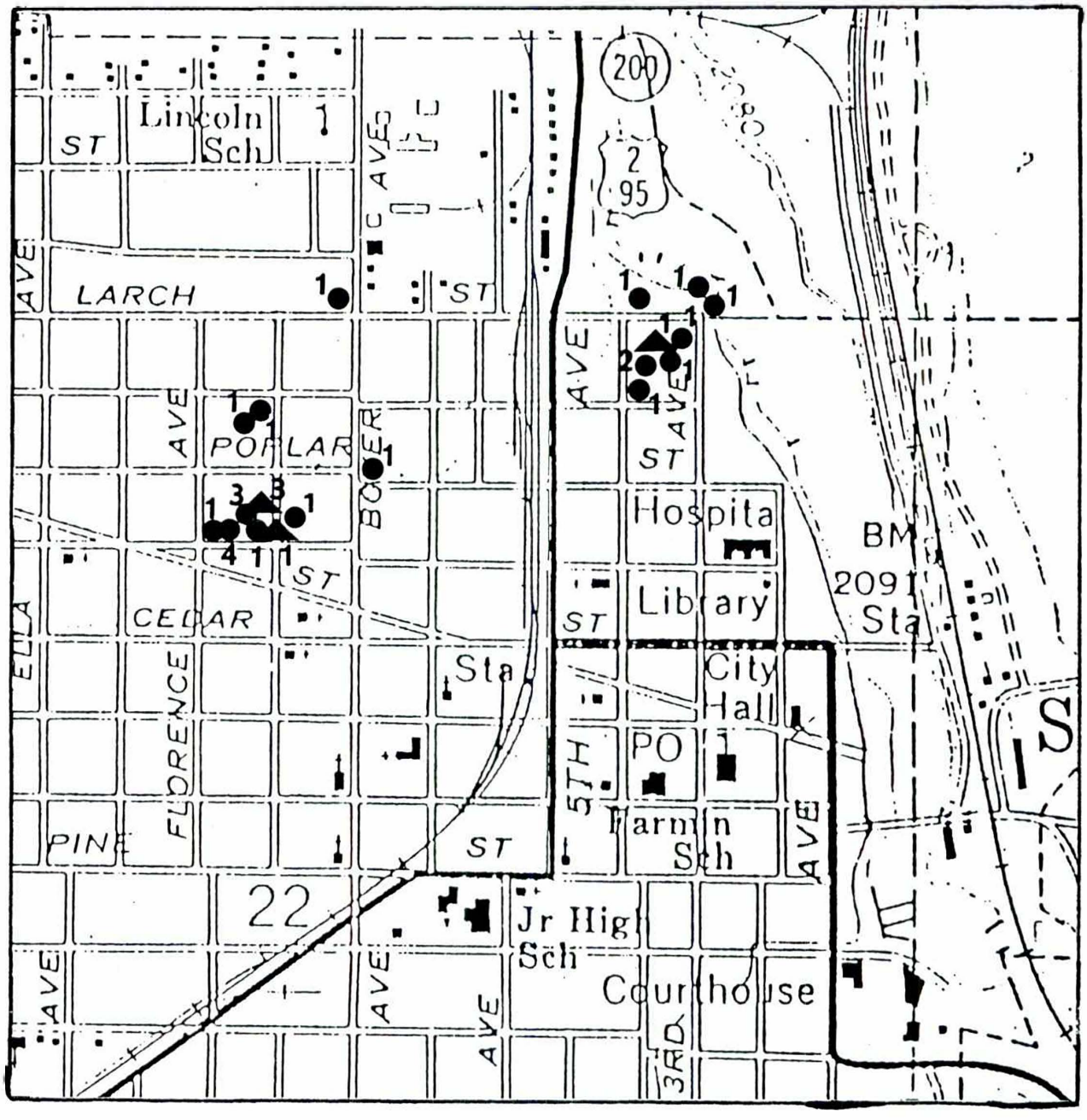


Figure 9. Detail of area of concentrated moth catches and egg masses found in Sandpoint.

●^{n} = site and number of moths caught

▲^{n} = site and number of egg masses found



DISCUSSION

In general the spray project and the mass trapping can be considered as successful. The pheromone trap counts in 1989 compared to 1988 dropped by 67 and 93 percent in Coeur d'Alene and Sandpoint, respectively. The egg masses were reduced in Sandpoint from 32 in 1988 to 5 in 1989. In Coeur d'Alene the numbers stayed the same with 2 in 1988 and 2 in 1989. However the infested area, as outlined by the survey traps, dropped from 110 acres to approximately 10 in Coeur d'Alene, and from 270 to 15 in Sandpoint.

The failure of the spray project to completely eradicate the gypsy moth population appears to be due to two factors. In Coeur d'Alene there was a continual south wind blowing from the lake that moved the spray inland before it was deposited. This had been predicted by the FSCBG model runs and the spray deposit cards showed this to be the case. The residual population, as determined by the pheromone traps and the location of the egg masses found, was confined to a narrow strip right along the lake shore. It appears that there was not adequate spray deposit to provide a lethal dose in that area.

In Sandpoint the residual population that was found within the boundaries of the spray block appeared to be associated entirely with one, very large, black walnut tree. Three of the four egg masses found at that site were on this tree and the fourth was only a very short distance away. We observed that all of the black walnut trees of the area were very slow in developing their foliage. The majority of the other host trees had nearly full foliage by the time of the first spray. When the foliage of the black walnuts did begin to develop, it appeared to grow so fast that there were new untreated leaves present within a very short time after each spray. This allowed a portion of the residual larval population to survive by feeding without contacting the pesticide.

The other Sandpoint population that was found outside of the spray area but within the mass-trapping zone may have resulted from an early instar female-caterpillar being blown by the wind the short distance outside of the original infestation area. It could have also resulted from movement of out door household articles. The low numbers of moths caught in the pheromone traps at that site would suggest that only one egg mass developed in the area.

The single moths that were caught some distance from the main population areas in both Coeur d'Alene and Sandpoint seem to have resulted from individuals that were either strong fliers or that got caught by the wind and were transported some distance from their point of origin. In all cases we have not caught any

additional moths when extra monitoring traps were placed around the sites where these single moths were caught.

While the mass trapping has obviously helped in the overall control effort, it apparently cannot be depended on to eradicate even low populations. This was demonstrated by our ability to find new egg masses within the trapping areas.

While we had hoped to eradicate the gypsy moth from Idaho with one year's efforts, it is apparent that it will take at least one more season.

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Rivas, A.M. 1989. Environmental assessment; gypsy moth eradication spray program. Bonner and Kootenai Counties, Idaho. Forest and Range Land Services, Ogden, UT. Prepared for the Idaho Department of Lands, Coeur d'Alene, Idaho. 36p.

APPENDIX A

1989 GYPSY MOTH CONTROL PROJECT PERSONNEL

Project Director - R. Ladd Livingston
Project Coordinator - Bob Tisdale

Spray Program:

Ground crew	-	David Beckman Faith Bergem Tina Green Mike Brown
Flight following	-	Sandra Gast
Heliport managers	-	Steve Douglas Thomas Johnson (T.J.)
Pilot	-	James R. Pope
Crew chief	-	James D. Pope
Mixer	-	Greg Garris

Mass Trapping Program:

Sandpoint trap crew	-	Cheryl Aragon Mike Booth Mike D. Brown Mike L. Brown Sue Fogey John Krackenberg Alischia Matthews Jeannie Mikkelsen Jeff Ward
Coeur d'Alene trap crew	-	Faith Bergem Russ McCabe Janet Walker
Records clerk	-	Tina Green

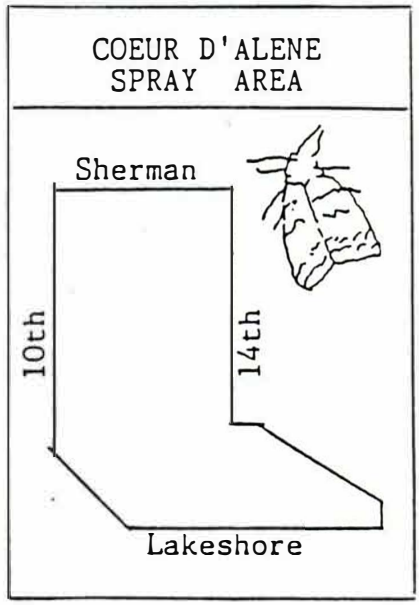
APPENDIX B

FLIER DISTRIBUTED TO RESIDENTS WITHIN COEUR d'ALENE SPRAY AREA

GYPSY MOTH SPRAY

The Idaho Department of Lands anticipates to begin aerial spraying for the gypsy moth on May 11, 1989. The actual spray date will depend on local weather conditions. Please listen to radio station KVNI for any changes. The spraying will start at approximately 5:00 a.m. and will end before 7:00 a.m. Two more sprays will be done at 7-10 day intervals following the first spray. The exact dates of the next sprays will be announced in the newspaper, on Radio station KVNI, and on Television station KXLY.

If you have any questions concerning the spraying please call the Department of Lands at 664-2171.



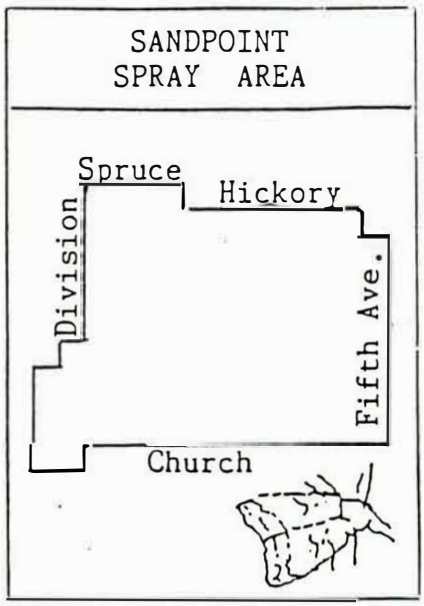
APPENDIX C

FLIER DISTRIBUTED TO RESIDENTS WITHIN SANDPOINT SPRAY AREA

GYPSY MOTH SPRAY

The Idaho Department of Lands anticipates to begin aerial spraying for the gypsy moth on May 12, 1989. The actual spray date will depend on local weather conditions. Please listen to radio station KSPT for any changes. The spraying will start at approximately 5:00 a.m. and will end before 7:00 a.m. Two more sprays will be done at 7-10 day intervals following the first spray. The exact dates of the next sprays will be announced in the newspaper, on Radio station KSPT, and on Television station KXLY.

If you have any questions concerning the spraying please call the Department of Lands at 664-2171 - Coeur d'Alene
263-5104 - Sandpoint



LETTER AND PESTICIDE TOXICOLOGY PROFILE
SENT TO PHYSICIANS OF SANDPOINT AND COEUR D'ALENE

IDAHO DEPARTMENT OF LANDS
P.O. BOX 670, COEUR D'ALENE, IDAHO 83814

STANLEY F. HAMILTON
DIRECTOR

Date : April 28, 1989

Memorandum

To : Physicians of Sandpoint and Coeur d'Alene

From : R. Ladd Livingston, Ph. D.
Supervisor, Insect and Disease Section

Subject : Aerial Spray Project

During the first two weeks of May, 1989, the Idaho Department of Lands will begin aerially spraying portions of Sandpoint (see map) in an effort to eradicate the gypsy moth.

The biological pesticide to be used is Dipel (see attached toxicology profile). The active ingredient in Dipel is Bacillus thuringiensis (B.t.). It is a naturally occurring, soil inhabiting, ubiquitous bacterium. It is not toxic in any way to humans, animals, birds, or any insect other than caterpillars of moths and butterflies.

The spraying will begin at approximately 5:00 am and will end before 7:00 am. Two additional sprays will occur at 7-10 day intervals following the first spray. Exact dates for all sprays will be announced in the Sandpoint Daily Bee and on KSPT Radio.

We ask that you familiarize yourself with the aspects of this pesticide and help us in reassuring the general public of its safety. Your cooperation is greatly appreciated.

RLL/tg

LETTER AND PESTICIDE TOXICOLOGY PROFILE SENT TO PHYSICIANS OF SANDPOINT AND COEUR D'ALENE

dipel®

Bacillus Thuringiensis Insecticide

TOXICOLOGY PROFILE

TOXICOLOGY

As evident from toxicology results, Dipel is one of the safest insecticides in use today. Its active ingredient is a bacterium, *Bacillus thuringiensis (B.t.),* which occurs naturally in the environment. *B.t.* has a highly specific mode of action. It effectively controls caterpillar larvae; however, the HD-1 strain of *B.t.* used in the production of Dipel has shown no toxicity to mammals, fish or other wildlife at recommended field rates. This is supported by Abbott's extensive toxicologic evaluation of Dipel and extensive testing by independent scientists. Further, in over 10 years of commercial use, no reports of adverse effects to the environment have been documented. Unlike most chemical pesticides, Dipel is ideally suited for use in integrated pest management programs since the active ingredient does not interrupt activities of beneficial insects.

ORAL TOXICITY

No toxicity in mice, rats or dogs has been demonstrated with single dosages up to 10,000 mg/kg of body weight.

Thirteen-week dietary administration of technical material to rats at dosages of 8,400 mg/kg/day produced no toxic effects.

Two-year chronic dietary administration of technical material to rats at 8,400 mg/kg/day produced no tumorigenic or oncogenic effects.

INHALATION TOXICITY

No toxic effects were observed in rats when Dipel 4L was instilled directly into the lungs at rates up to 5 mg/kg of body weight. This translates to a value 10,000 times greater than a bystander could expect during spray programs. Humans exposed daily to *B.t.* spores for over 10 years have shown no adverse effects.

DERMAL TOXICITY

Mild, transient dermal irritation was seen, but no systemic toxicity was noted in rabbits when Dipel 4L was applied to abraded skin at 1 mg/kg/day for 21 days. In other studies, a single epidermal application of Dipel 4L at 7.2 g/kg was not toxic to rabbits.

TOXICOLOGY TO BEES

No toxicity to honeybees has been demonstrated during extensive laboratory and field studies with Dipel products at labeled rates.

TOXICITY TO BENEFICIAL INSECTS

No toxic effects to beneficial or predacious arthropods have been observed at labeled rates of Dipel. These results are based on laboratory and field studies performed on over 200 species of beneficial insects/spiders in the orders: Hymenoptera, Diptera, Neuroptera, Orthoptera, Araneae, Coleoptera and Hemiptera. Due to its safety to beneficials and unique mode of action, Dipel is an ideal component of integrated pest management programs.

EYE IRRITATION

No corneal opacity was observed in rabbits treated with 0.1 ml of Dipel 4L. Only mild, transient irritation was noted in this study, and in other tests with wettable powder formulations.

SENSITIZATION

No evidence of sensitization was noted in guinea pigs given repeated subcutaneous injections of *B.t.* technical material.

I.V. INJECTION

A single I.V. dose of 10^8 *B.t.* spores was not toxic to young growing rats. There was no evidence of sporulation of *B.t.* within the visceral tissues over the course of a 112-day experiment.

TOXICITY TO FISH

No adverse effects were shown in rainbow trout and bluegills exposed to *B.t.* technical material for 96 hours at concentrations of 560 and 1,000 ppm.

A small marine fish, *Anguilla anguilla*, was not adversely affected by exposure to 1,000-2,000 times the level of *B.t.* expected during spray programs.

Field observations, one month after aerial application of Dipel, revealed no effects on populations of brook trout, common white suckers and smallmouth bass.

TOXICITY TO ZOOPLANKTON

Aerial spraying at labeled rate of Dipel 4L, had no effects on populations of Cladoura, Copepoda and Rotifera species.

TOXICITY TO BIRDS

LD_{50} — Bobwhite Quail — greater than 10 grams *B.t.*/kg body weight; autopsy of the birds revealed no pathology attributable to *B.t.* LD_{50} — Mallard — greater than 2000 grams *B.t.*/kg. Field observations of 74 bird species revealed no population fluctuations after aerial application of Dipel.

RESIDUES

Since Dipel products have not been shown to be toxic to nontarget organisms, spray drift and residues do not present a health hazard.

TOLERANCE

Dipel has been granted exemption from the requirement of tolerance on all registered crops in Canada and the United States. The wettable powder formulation may be applied to certain raw agricultural commodities after harvest.

VIRAL ENHANCEMENT

The susceptibility of cell cultures to viral infection was not enhanced after Dipel 4L exposure.

APPENDIX E

TRAP DATA CARD

TRAP NO. _____ — _____
(City/Site No.) (Trap No.)

AREA _____
(N, SW, SE)

CITY/SITE _____

ADDRESS _____

COUNTY _____

SURVEYOR _____
(Initials)

DATE TRAPS SERVICED	TRAP CATCH (Put date trap set here)	INSPECTOR

PROPERTY DIAGRAM

N
W E
S

(If trap is relocated, indicate location of new trap site.)

IDAHO GYPSY MOTH SURVEY
TRAP CARD

APPENDIX F

LETTER ASKING PERMISSION TO PLACE TRAP

Date _____

TO: Occupant(s) of _____

FROM: R. Ladd Livingston, Supervisor
Insect & Disease Section - 664-2171

SUBJECT: GYPSY MOTH TRAPPING PROGRAM

Each summer the Idaho Department of Lands conducts a trapping program to search for new introductions into our state of an insect called the "gypsy moth." This is accomplished by placing a small, orange or green gypsy moth trap in trees or on fence posts at strategic sites. The trap contains a lure which attracts male gypsy moths to it. The moths are then caught in the trap. There are no harmful chemicals in the trap.

Our survey technician (trapper) for your area has attempted to find someone home at your residence to request your permission to place a trap on your property. It is important that all traps be "in place" before the end of July. Therefore, the survey technician, in an effort to get the traps placed in time, has put one or more traps on you property at the following site(s):

_____

_____

If you would prefer not to have a trap on your property, please contact,

_____

(Name) (Phone)

and the trap will be removed.

A survey technician will check your trap(s) twice during the summer, and remove the traps on the third visit at the end of September or early in October.

Attached is some literature about the gypsy moth and the trap.

Thank you very kindly for your assistance.

RLL/tg

APPENDIX G

LISTING OF MOTH CATCHES and EGG MASSES FOUND, BY ADDRESS

SANDPOINT, BONNER CO.

SURVEY TYPE*	TRAP NUMBER	ADD\DESC.	TRAP PERIOD #1 DATE	TRAP PERIOD #1 NO.MTHS	TRAP PERIOD #2 DATE	TRAP PERIOD #2 NO.MTHS	TRAP PERIOD #3 DATE	TRAP PERIOD #3 NO.MTHS	TOTAL MOTHS	EGG MASSES
d	20	PINECREST LOOP	9/25/89	1					1	
d	22	UPLAND DR	9/25/89	1					1	
d	23	UPLAND DR	9/25/89	1					1	
d	25	UPLAND DR	8/21/89	1					1	
d	48	MT VIEW RD	9/25/89	1					1	
d	58	WOODLAND DR	9/25/89	1					1	
**		321 LARCH							0	1
e	1608	805 BOYER	8/18/89	1					1	
e	2179	404 LARCH	8/16/89	1					1	
e	2187	302 LARCH	8/18/89	1					1	
e	2188	302 LARCH	8/16/89	1					1	
e	2204	712 FOURTH	8/16/89	1					1	
e	2207	716 FOURTH	8/16/89	1	8/21/89	1			2	
e	2212	719 THIRD	8/16/89	1					1	
e	2214	719 THIRD	8/16/89	1					1	
e	2308	602 BOYER	9/29/89	1					1	
e	2745	812 ALDER	8/08/89	1	8/15/89	3			4	3
e	2746	814 ALDER	8/08/89	1					1	
e	2747	808 ALDER	8/07/89	1	8/15/89	1	8/21/89	1	3	
e	2748	804 ALDER	8/22/89	1					1	1
e	2751	813 POPLAR	8/08/89	1					1	
e	2753	813 POPLAR	8/10/89	1					1	
e	2774	504 FOREST	8/07/89	1					1	
e	5269	2016 BROWNING	10/03/89	1					1	
		TOTALS: No traps: 23	No.Moths:	23		5		1	29	5

* "e" = eradication trap; "d" = detection trap

** egg mass only

LISTING OF MOTH CATCHES and EGG MASS FOUND, BY ADDRESS

COEUR D'ALENE, KOOTENAI CO.

SURVEY TYPE*	TRAP NUMBER	ADD\DESC.	TRAP PERIOD #1 DATE	TRAP PERIOD #1 NO.MTHS	TRAP PERIOD #2 DATE	TRAP PERIOD #2 NO.MTHS	TRAP PERIOD #3 DATE	TRAP PERIOD #3 NO.MTHS	TOTAL MOTHS	EGG MASSES
d	17	CITY PARK-PUBLIC RESTROOM	9/25/89	1					1	
d	71	1038 15TH	8/11/89	1					1	
d	134	MEDINA AVE	9/25/89	1					1	
d	135	1001 EMMA	9/25/89	1					1	
e	3	1109 CDA	8/22/89	1					1	
e	212	301 S. 15TH	8/23/89	1					1	
e	441	1307 ASH	8/23/89	1					1	
e	455	609 DOLLAR	8/15/89	1					1	
e	502	1415 E. LAKESHORE	8/15/89	1					1	
e	544	1215 E. LAKESHORE	8/11/89	1					1	
e	562	S. SIDE OF E. LAKESHORE DR.	9/18/89	1					1	
e	569	1501 E. LAKESHORE DR.	8/15/89	1					1	
e	576	1501 E. LAKESHORE DR.	8/29/89	1					1	
e	929	420 S. 11TH	8/10/89	1					1	
e	1257	815 S. 11TH	8/11/89	1					1	
e	1262	801 S. 11TH	8/17/89	1					1	
e	1266	777 S. 11TH	8/18/89	1					1	
e	1269	771 S. 11TH	8/15/89	1					1	
e	1277	720 S. 11TH	8/15/89	1					1	
e	1292	ASH ALLEY BET 11TH & 12TH	8/11/89	1					1	
e	1294	806 S. 11TH	8/07/89	1					1	
e	1296	1101 E. LAKESHORE	8/10/89	1	8/14/89	1	8/18/89	1	3	2
e	1297	1101 E. LAKESHORE	8/07/89	1	8/08/89	1	8/14/89	1	3	
e	1299	1103 E. LAKESHORE	8/14/89	1					1	
e	1300	1103 E. LAKESHORE	8/30/89	1					1	
e	1304	811 S. 12TH	8/11/89	1	8/14/89	1			2	
e	1320	1010 S. 10TH	8/22/89	1					1	
		TOTALS: No traps: 27	No.Moths:	27		3		2	32	2

* "e" = eradication trap; "d" = detection trap

4601